

APPENDIX C

MATERIAL SAFETY DATA SHEETS

ABBREVIATED ACCIDENT PREVENTION PLAN (AAPP)

NOTE: Site Visits, only. (Please type or print)

Project Site: _____

Contract Number: _____ Task Order: _____

Contractor Name: _____

Contractor Address: _____

Prepared by: _____ Signature: _____ Date: _____

Telephone Number: _____ E-mail Address: _____
(Include area code)

U. S. Army Corps of Engineers, Huntsville Center (CEHNC) Project Manager (PM)

Name: _____ Telephone: _____
(Include area code)

Accepted by: CEHNC Safety Office

Name: _____ Date: _____

Notice: The contractor and all subcontractors must comply with all Occupational Safety and Health Administration (OSHA) laws, state and local mandates and adhere to the requirements of EM 385-1-1, Corps of Engineers Safety and Health Requirements Manual. **This AAPP is not intended to define full compliance with OSHA or other safety laws, codes or regulations.** Compliance with OSHA and other safety laws, codes or regulations, and maintaining a safe work environment for contractor or subcontractor employees remains the Contractor's responsibility.

NOTE: This AAPP is to be used for site visits only and must be accepted by the CEHNC Safety Office prior to the site visit. All members of the site visit team must comply with the provisions within this AAPP and attend a tailgate safety briefing just prior to the start of the visit and complete the Site Visit Team Statement on Page 7.

SPECIAL INSTRUCTIONS: Coordination must be made with the installation prior to conducting the site visit. Contact the CEHNC PM to assist in making arrangements. **Photographs** and **Video Recording** must also be coordinated with the CEHNC PM, if it is determined to be a necessary requirement.

1. PURPOSE OF THE SITE VISIT. (Examples: Field survey, gather data, records search/review, inspection)

2. PRESENT USAGE. (Check ALL that apply)

- | | | | |
|--|--|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> Military Installation | <input type="checkbox"/> Residential/Housing | <input type="checkbox"/> Recreational | <input type="checkbox"/> Nature Area |
| <input type="checkbox"/> Hospital | <input type="checkbox"/> Facility Support | <input type="checkbox"/> Commercial | <input type="checkbox"/> Agricultural |
| <input type="checkbox"/> Medical Clinic | <input type="checkbox"/> Child Care | <input type="checkbox"/> Industrial | <input type="checkbox"/> Active |
| <input type="checkbox"/> Dental Clinic | <input type="checkbox"/> Dining Facility | <input type="checkbox"/> Landfill | <input type="checkbox"/> Inactive |
| <input type="checkbox"/> Other – specify _____ | | | |

3. CONTRACTOR PERSONNEL RESPONSIBILITIES.

Contractor Team Leader (CTL):

Name: _____ Office: _____

Address: _____ Telephone: _____
(Include area code)

CTL Responsibilities: CTL is responsible for communicating the requirements contained in this AAPP to all team members. The CTL and/or SSHO shall hold a brief tailgate meeting in which the site-specific topics for the day's activities will be discussed. **The SSHO responsibilities can be performed by the CTL.**

Site Safety and Health Officer (SSHO):

Name: _____ Office: _____

Address: _____ Telephone: _____

(Include area code)

SSHO Responsibilities: SSHO will assist the CTL in the instruction/briefing and oversight of the requirements of this AAPP during site/field visit.

Team Members (Other than those listed above)

Name: _____ Company: _____ Phone: _____

Name: _____ Company: _____ Phone: _____

Name: _____ Company: _____ Phone: _____

Name: _____ Company: _____ Phone: _____

Name: _____ Company: _____ Phone: _____

Name: _____ Company: _____ Phone: _____

Team Member Responsibilities: All Team Members are required to read or be briefed on the requirements contained in this AAPP during the tailgate meeting held by the CTL on SSHP. Team members will sign the CTL's Site Visit Team Statement on Page 7 signifying they understand and will comply with the requirements. This statement is to be maintained in the Contractor's on-site files through the entire life of the task order or project. The statement should only be completed prior to the actual visit taking place. It does not have to accompany the AAPP submitted for review.

4. GENERAL DESCRIPTION OF SITE ACTIVITIES.

- | | | | |
|--|---|--|-------------------------------------|
| <input type="checkbox"/> Walk-through | <input type="checkbox"/> Off road | <input type="checkbox"/> Over/on water | <input type="checkbox"/> Fence line |
| <input type="checkbox"/> Drive-through | <input type="checkbox"/> Off paths/trails | <input type="checkbox"/> Fly over | <input type="checkbox"/> Crawlspace |
| <input type="checkbox"/> On/Near roadway | <input type="checkbox"/> On paths/trails | <input type="checkbox"/> Basement | <input type="checkbox"/> Attic |

5. HAZARD EVALUATION.

Check ALL hazards that could be present or encountered during the site/field visit. ALL potential hazards checked must include a brief mitigation measure or measures and document those on Pages 5 and 6. After hazards and mitigation measures have been identified complete Paragraphs 6 thru 13.

- | | | |
|--|--|--|
| <input type="checkbox"/> Electrical | <input type="checkbox"/> Climbing | <input type="checkbox"/> Biological |
| <input type="checkbox"/> Mechanical | <input type="checkbox"/> Work from Elevation | <input type="checkbox"/> Chemical |
| <input type="checkbox"/> Slip/Trips/Falls | <input type="checkbox"/> Material Handling | <input type="checkbox"/> Lifting |
| <input type="checkbox"/> Squatting/Bending | <input type="checkbox"/> Water Hazards | <input type="checkbox"/> Wildlife |
| <input type="checkbox"/> Eye Hazard | <input type="checkbox"/> Head Hazard | <input type="checkbox"/> Foot hazard |
| <input type="checkbox"/> Environment | <input type="checkbox"/> Weather | <input type="checkbox"/> Heat Stress |
| <input type="checkbox"/> Cold Stress | <input type="checkbox"/> Insects | <input type="checkbox"/> Overhead Hazard |
| <input type="checkbox"/> Traffic Hazard | <input type="checkbox"/> Flammable Materials | <input type="checkbox"/> Tools |
| <input type="checkbox"/> Confined Space | <input type="checkbox"/> Toxic Materials | <input type="checkbox"/> Terrain |
| <input type="checkbox"/> Excavations | <input type="checkbox"/> Noise | <input type="checkbox"/> Motor Vehicle |

Other Hazards not listed:

☐ _____

6. HAZARD EVALUATION RISK ASSESSMENT.

☐ HIGH RISK ☐ MEDIUM RISK ☐ LOW RISK

Risk Assessment Levels:

High Risk – Those activities or tests that present significant risk to personnel, equipment, or property, even after precautionary measures have been taken. High Risk activities are **not** to be conducted during site visits. Contact CEHNC PM for further direction.

Medium Risk – Those activities or tests that present greater risk to personnel, equipment, or property than normal site visit tasks, and require more than routine supervision.

Low Risk – Those activities or tests that present no greater risk than normal site visit tasks. Routine supervision is appropriate.

7. COMMUNICATION. Means of communication shall be provided and identified below.

☐ Cell phone ☐ Two-way radio ☐ Desk Telephone ☐ Other _____

8. FIRST AID/CPR REQUIREMENTS. When a medical facility or physician is not accessible within five minutes of an injury to a group of two or more employees for the treatment of injuries, at least two contractor employees conducting the site visit shall be qualified to administer First Aid and CPR. In addition, the contractor will provide and make readily available a properly equipped First Aid Kit to treat their employees. **Special Note: This is not a requirement for employees engaged in routine office/administrative activities.**

First Aid/CPR Certified Person(s) on Team:

Name: _____ Telephone: _____
(Include area code)

Name: _____ Telephone: _____
(Include area code)

9. EMERGENCY RESPONSE.

Prior to the site visit, arrangements shall be made for medical treatment. When Installation/Government Facility is to provide any emergency response or medical treatment those arrangements must be made prior to the visit. A means of transporting injured or ill persons shall also be readily available, e.g., POV, Company Vehicle, etc. as identified below:

☐ POV ☐ Company Vehicle ☐ Other

Emergency numbers, call letters, etc., and the method(s), e.g., cell phone, two-way radio, etc., to summons emergency response organizations shall be identified below:

| | |
|------------------------|----------------------|
| MEDICAL FACILITY _____ | SUMMONS METHOD _____ |
| FIRE DEPARTMENT _____ | SUMMONS METHOD _____ |
| MILITARY POLICE _____ | SUMMONS METHOD _____ |
| LOCAL POLICE _____ | SUMMONS METHOD _____ |
| CEHNC PM _____ | |
| FACILITY CONTACT _____ | |
| OTHERS (List) _____ | |

10. TRAINING. The Contractor is responsible for briefing their employees as well as all subcontractors, and shall meet the required training requirements determined by the contractor to be applicable in this AAPP. See Paragraphs 5 and 8.

11. MINIMUM SAFETY REQUIREMENTS.

a. If conditions change or hazards arise not previously anticipated or not covered by this AAPP, the Team Members are to stop the activities, leave the area if it is hazardous, and notify the CTL and/or SSO.

b. Restricted or POSTED areas. DO NOT enter without permission of the Installation or Proponent. Smoke in designated areas only.

c. If task involves access to a remote or restricted area, the Two-Person or BUDDY System will be used. The two persons must maintain contact by line of sight and orally at all times. Emergency communication (Two-Way Radio, Cell phone or similar device) must be readily available at all times under these conditions.

d. Avoid overgrown vegetation, tall grass, and similar areas if possible. In seasons of insects and reptiles, protective measures such as boots, chaps, and repellants should be used when needed. The Buddy System will always be used in these areas. Emergency communication (Two-Way Radio, Cell phone or similar device) must be maintained at all times under these conditions.

e. Always walk facing traffic, in a single file, and each person must wear a reflective vest when walking along roadways. Flashlights are required during periods of poor visibility e.g., dawn, dusk, after dark, fog, etc.

f. Electrical energized equipment. Do not enter switchgear room or switchyards without an escort who is familiar with the area and/or the associated hazards.

g. Excavated Area. Do not enter trenches and holes without an escort who is familiar with the area and/or the associated hazards.

12. PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT (PPE).

a. Appropriate clothing shall be worn to abate the hazards identified in Paragraph 5 above. Employees shall wear clothing suitable for the weather and work conditions. As a minimum, long trousers, a sleeved shirt, and leather safety boots or sturdy shoes are required. Shoes are to be commensurate to the hazard.

b. A Hard Hat is required on all construction and renovation jobs or where overhead hazards exist.

c. Safety Glasses with side shields are required when eye hazards exist.

d. Hearing protection is required when sound levels reach or exceed allowable limits.

13. ACCIDENT REPORTING. In the event of an accident, the contractor will notify the CEHNC PM immediately. The contractor is responsible for conducting accident investigations. The CEHNC PM will advise as to the forms that must be completed and submitted to the CEHNC Safety Office.

**ABBREVIATED ACCIDENT PREVENTION PLAN (AAPP)
MITIGATION MEASURES FROM PARAGRAPH 5**

| <u>Hazard</u> | <u>Mitigation</u> |
|----------------------|--------------------------|
| Electrical | |
| Mechanical | |
| Slip/Trips/Falls | |
| Squatting/Bending | |
| Eye Hazard | |
| Environment | |
| Cold Stress | |
| Traffic Hazard | |
| Confined Space | |
| Excavations | |
| Climbing | |
| Work from Elevation | |
| Material Handling | |
| Water Hazards | |
| Head Hazard | |
| Weather | |

Insects _____

Flammable Materials _____

Toxic Materials _____

Noise _____

Biological _____

Chemical _____

Lifting _____

Wildlife _____

Foot hazard _____

Heat Stress _____

Overhead Hazard _____

Tools _____

Terrain _____

Motor Vehicle _____

Other Hazard(s) _____

Other Hazard(s) _____

Other Hazard(s) _____

Other Hazard(s) _____

**ABBREVIATED ACCIDENT PREVENTION PLAN (AAPP)
SITE VISIT TEAM STATEMENT
FOR**

(Site Name and Location)

NOTE: This statement is the record to be maintained in the Contractor's on-site files through the entire life of the task order or project. The statement should only be completed just prior to the actual visit taking place. It does not have to accompany the AAPP submitted for review.

1. The contractor will sign this statement:

a. Prior to the start of the site visit.

b. When a change is made to this AAPP.

2. I have read, or have had read to me, and understand the general and specific safety and environmental requirements, and will abide by the contents contained in the AAPP. I have been briefed and trained in, and am familiar with, my requirements to conduct the site visit.

| <u>NAME (Print)</u> | <u>Office</u> | <u>Signature</u> | <u>Date</u> |
|---------------------|---------------|------------------|-------------|
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |
| _____ | _____ | _____ | |

Team Leader or Site Safety Officer presenting Briefing:

| | | |
|--------|-------------|--------|
| _____ | _____ | _____ |
| (Name) | (Signature) | (Date) |



MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: ANTIMONY

TRADE NAMES/SYNONYMS:

ANTIMONY BLACK; ANTIMONY REGULUS; STIBIUM; ANTIMONY POWDER; ANTIMONY
ELEMENT; UN 2871; Sb; OHS01610; RTECS CC4025000

CHEMICAL FAMILY: metal

CREATION DATE: Sep 11 1984

REVISION DATE: Sep 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: ANTIMONY

CAS NUMBER: 7440-36-0

EC NUMBER (EINECS): 231-146-5

PERCENTAGE: 100

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=2 REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: white

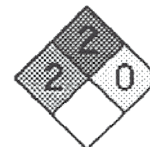
PHYSICAL FORM: solid

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: irritation, metal fume fever, difficulty breathing, dizziness, lung



damage, blood disorders

LONG TERM EXPOSURE: irritation, metal fume fever, nausea, vomiting, diarrhea, loss of appetite, weight loss, loss of voice, chest pain, difficulty breathing, headache, dizziness, sleep disturbances, lung damage, reproductive effects

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation, skin disorders

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation

INGESTION:

SHORT TERM EXPOSURE: irritation (possibly severe), changes in blood pressure, nausea, vomiting, diarrhea, difficulty breathing, lung congestion, internal bleeding, kidney damage, liver damage, coma

LONG TERM EXPOSURE: irritation, nausea, vomiting, diarrhea, stomach pain, loss of appetite, weight loss, loss of voice, headache, dizziness, sleep disturbances, blood disorders, reproductive effects

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

ANTIDOTE: dimercaprol/oil, intramuscular.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage and catharsis.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Moderate fire hazard.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray

FIRE FIGHTING: Move container from fire area if it can be done without risk. Use extinguishing

agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

LOWER FLAMMABLE LIMIT: 0.42 g/L

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Do not touch spilled material. Stop leak if possible without personal risk. Small spills: Absorb with sand or other non-combustible material. Collect with absorbent into suitable container. Small dry spills: Collect spilled material in appropriate container for disposal. Move containers away from spill to a safe area. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

ANTIMONY:

0.5 mg/m³ OSHA TWA

0.5 mg/m³ ACGIH TWA

0.5 mg(Sb)/m³ NIOSH recommended TWA 10 hour(s)

0.5 mg/m³ DFG MAK (peak limitation category-III) (inhalable dust fraction)

0.5 mg(Sb)/m³ UK MEL TWA

MEASUREMENT METHOD: Particulate filter; Acid; Flame atomic absorption spectrometry; NIOSH II(4) # 261, P&CAM

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

Measurement Element:

Antimony (Sb)

5 mg/m³

Any dust and mist respirator except single-use and quarter-mask respirators.

Any supplied-air respirator.

12.5 mg/m³

Any supplied-air respirator operated in a continuous-flow mode.

Any powered, air-purifying respirator with a dust and mist filter.

25 mg/m³

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any supplied-air respirator with a tight-fitting facepiece that is operated in a continuous-flow mode.

Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.

Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

50 mg/m³

Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode.

Escape -

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: solid

APPEARANCE: lustrous

COLOR: white

ODOR: Not available

MOLECULAR WEIGHT: 121.75

MOLECULAR FORMULA: Sb

BOILING POINT: 3182 F (1750 C)

MELTING POINT: 1166 F (630 C)

VAPOR PRESSURE: 1 mmHg @ 886 C

VAPOR DENSITY: Not applicable

SPECIFIC GRAVITY (water=1): 6.684

WATER SOLUBILITY: insoluble

PH: Not applicable

VOLATILITY: Not applicable

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not applicable

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: ammonium sulfide solutions, hot sulfuric acid

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Avoid generating dust. Keep out of water supplies and sewers.

INCOMPATIBILITIES: acids, oxidizing materials, metals, halogens, combustible materials, peroxides, metal oxides, bases, metal salts

ANTIMONY:

ACIDS: Moderate to violent reaction.

ALKALINE NITRATES: Explosive reaction possible.

ALUMINUM (POWDERED): Violent reaction on heating.

AMMONIUM NITRATE: Explosive reaction with powdered antimony.

AQUA REGIA: Readily attacks antimony.

BROMINE: Spontaneous ignition.

BROMINE PENTAFLUORIDE: Contact at ambient or slightly elevated temperatures may result in violent ignition.

BROMINE TRIFLUORIDE: Violent reaction with incandescence.

BROMOAZIDE: Explosion on contact.

CHLORIC ACID: Forms explosive compound.

CHLORINE (GAS): Spontaneous ignition.

CHLORINE (LIQUID): Spontaneous ignition at 33 C.

CHLORINE MONOXIDE (GAS): Violent explosion on contact.

CHLORINE TRIFLUORIDE: Contact at ambient or slightly elevated temperatures may result in violent ignition.

DICHLORINE OXIDE: Explosion on contact.

DISULFUR DIBROMIDE: Violent reaction with finely divided antimony.

FLUORINE: Spontaneous ignition.

HALOGENATED ACIDS: Incompatible.

IODINE: Ignition reaction; large amounts may result in explosion.

IODINE PENTAFLUORIDE: Incandescent reaction.

NITRATE SALTS: Vigorous or violent reaction.

NITRIC ACID: Violent reaction with finely divided antimony.

NITROSYL FLUORIDE: Incandescent reaction.

OXIDIZERS: Fire and explosion hazard.

PERCHLORIC ACID: Hazardous reaction with trivalent antimony.

PEROXIDES (MIXTURES): May react explosively.

POTASSIUM DIOXIDE: Oxidation reaction with incandescence.

POTASSIUM NITRATE: Explosive reaction with powdered antimony.

POTASSIUM PERMANGANATE: Ignites on grinding in mortar.

POTASSIUM PEROXIDE: Formation of explosive mixture.

SELENINYL CHLORIDE: Ignition on contact with powdered antimony.

SODIUM NITRATE: Explosive reaction with powdered antimony.

SODIUM PEROXIDE: Formation of explosive mixture on heating.

SULFURIC ACID: Readily attacked.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: antimony compounds, antimony

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

ANTIMONY:**TOXICITY DATA:**

7 gm/kg oral-rat LD50; 100 mg/kg intraperitoneal-rat LD50; 90 mg/kg intraperitoneal-mouse LD50; 150 mg/kg intraperitoneal-guinea pig LD50

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Slightly Toxic: ingestion

TUMORIGENIC DATA:

50 mg/m3 inhalation-rat TCLo/7 hour(s)-52 week(s) intermittent

HEALTH EFFECTS:**INHALATION:**

ANTIMONY: See information on metal fume fever.

ACUTE EXPOSURE:

ANTIMONY: Inhalation of antimony or its compounds may cause irritation of the respiratory and gastrointestinal tracts, sore throat, shallow respiration, dizziness, weight loss, gingivitis, anemia, eosinophilia, and inhibition of some enzyme systems, such as protein or carbohydrate metabolism. Pulmonary congestion, edema and death due to respiratory or circulatory failure may occur. Pathologic findings include acute congestion of the heart, liver, and kidneys.

METAL FUME FEVER: Metal fume fever, an influenza-like illness, may occur due to the inhalation of freshly formed metal oxide particles sized below 1.5 microns and usually between 0.02-0.05 microns. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur. Tolerance to fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours.

CHRONIC EXPOSURE:

ANTIMONY: Repeated or prolonged inhalation of antimony or its compounds may cause stomatitis, dry throat, metallic taste, gingivitis, septal and laryngeal perforation, laryngitis, headache, dyspnea, indigestion, nausea, vomiting, diarrhea, anorexia, anemia, weight loss, pain or tightness in the chest, sleeplessness, muscular pain and weakness, dizziness, pharyngitis, bronchitis, and pneumonitis. Degenerative changes of the liver and kidneys may occur later. Benign pneumoconiosis and obstructive lung diseases has been reported in workers. Women may be more susceptible to the systemic effects of exposure. Antimony crosses the placenta, is present in amnionic fluid, and is excreted in human milk. A study reported an increased incidence of spontaneous late abortions, premature births, and gynecological problems among female antimony smelter workers. An excess of deaths from lung cancer has been reported in smelter workers with more than 7 years exposure to relatively high levels of antimony dust and fumes. Animal studies indicate that antimony dust causes pathological changes in cardiac muscle and may induce interstitial pneumonitis and endogenous lipoid pneumonia. As evaluated by RTECS, administration to rats by inhalation resulted in a statistically significant increase in the incidence of carcinogenic tumors of the lungs and thorax.

METAL FUME FEVER: There is no form of chronic metal fume fever, however, repeated bouts with symptoms as described above are quite common. Resistance to the condition develops after a few days of exposure, but is quickly lost in 1 or 2 days.

SKIN CONTACT:**ACUTE EXPOSURE:**

ANTIMONY: Direct contact with dusts from antimony or its compounds may cause irritation with itching.

CHRONIC EXPOSURE:

ANTIMONY: Repeated or prolonged contact with antimony or its compounds may cause itching skin, papules and pustules around sweat and sebaceous glands, but rarely around the face, and dermatitis. Prolonged exposure by antimony smelter workers resulted in skin rashes on forearms and thighs resembling chicken pox pustules.

EYE CONTACT:

ACUTE EXPOSURE:

ANTIMONY: Direct contact with dust or fumes may cause irritation and inflammation of the cornea.

CHRONIC EXPOSURE:

ANTIMONY: Repeated or prolonged exposure may cause conjunctivitis.

INGESTION:

ACUTE EXPOSURE:

ANTIMONY: Ingestion of antimony or its compounds may cause violent irritation of the nose, throat, stomach, and intestines, nausea, vomiting, severe diarrhea with mucous and later with blood, slow and shallow respiration, and low blood pressure. Hemorrhagic nephritis and hepatitis may occur concomitantly or follow later. Pulmonary congestion and edema, coma, and death from circulatory or respiratory failure may occur.

CHRONIC EXPOSURE:

ANTIMONY: Repeated or prolonged ingestion of antimony or its compounds may cause sores in the mouth and throat, dry throat, gingivitis, laryngitis, headache, indigestion, nausea, vomiting, diarrhea, anorexia, anemia, weight loss, sleeplessness, and dizziness. Degenerative liver and kidney changes may occur later. Women may be more susceptible to the systemic effects from antimony exposure. Antimony crosses the placenta, is present in amniotic fluid, and is excreted in human milk.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

FISH TOXICITY: >6200 - <8300 ug/L 96 hour(s) LC50 (Mortality) Sheepshead minnow (*Cyprinodon variegatus*)

INVERTEBRATE TOXICITY: >4150 ug/L 96 hour(s) LC50 (Mortality) Opossum shrimp (*Mysidopsis bahia*)

ALGAL TOXICITY: >4150 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (*Skeletonema costatum*)

FATE AND TRANSPORT:

BIOCONCENTRATION: 14.00 uCi/L NR month(s) BCF (Residue) Toothed wrack (*Fucus serratus*) 2 uCi/L

ENVIRONMENTAL SUMMARY: Toxic to aquatic life.

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Antimony powder

ID NUMBER: UN2871

HAZARD CLASS OR DIVISION: 6.1

PACKING GROUP: III



CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

SHIPPING NAME: Antimony powder

ID NUMBER: UN2871

CLASSIFICATION: 6.1

PACKING GROUP: III

LAND TRANSPORT ADR/RID:

PROPER SHIPPING NAME: Antimony powder

UN NUMBER: UN2871

ADR/RID CLASS: 6.1

CLASSIFICATION CODE: T5

PACKING GROUP: III

AIR TRANSPORT IATA/ICAO:

PROPER SHIPPING NAME: Antimony powder

UN/ID NUMBER: UN2871

IATA/ICAO CLASS: 6.1

PACKING GROUP: III

MARITIME TRANSPORT IMDG:

PROPER SHIPPING NAME: Antimony powder

UN NUMBER: UN2871

IMDG CLASS: 6.1

PACKING GROUP: III

SECTION 5 REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):

ANTIMONY: 5000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes

CHRONIC: No
 FIRE: Yes
 REACTIVE: No
 SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
ANTIMONY

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (CALCULATED):

| | |
|----|----------|
| Xi | Irritant |
|----|----------|

DANGER/HAZARD SYMBOL:



EC RISK AND SAFETY PHRASES:

| | |
|---------|---|
| R 36 | Irritating to eyes. |
| R 37 | Irritating to respiratory system. |
| R 38 | Irritating to skin. |
| S 2 | Keep out of reach of children. |
| S 24 | Avoid contact with skin. |
| S 25 | Avoid contact with eyes. |
| S 26 | In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. |
| S 46 | If swallowed, seek medical advice immediately and show this container or label. |

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES SECTION 14 TRANSPORT INFORMATION

©Copyright 1984-2002 MDL Information Systems, Inc. All rights reserved.

mhtml:file://P:\742685\General%20HASP\MSDSs\antimony%20msds03.mht

2/27/2003



MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: ARSENIC

TRADE NAMES/SYNONYMS:

ARSENIC, SOLID; ARSENIC-75; ARSENIC BLACK; COLLOIDAL ARSENIC; METALLIC
ARSENIC; GREY ARSENIC; ARSENIC, METALLIC; As; UN 1558; OHS01980; RTECS
CG0525000

CHEMICAL FAMILY: metal

CREATION DATE: Sep 12 1984

REVISION DATE: Sep 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: ARSENIC

CAS NUMBER: 7440-38-2

EC NUMBER (EINECS): 231-148-6

EC INDEX NUMBER: 033-001-00-X

PERCENTAGE: 100

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=0 REACTIVITY=0

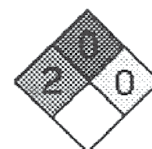
EMERGENCY OVERVIEW:

COLOR: gray to black

PHYSICAL FORM: solid

ODOR: garlic odor

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, nervous
system damage, allergic reactions, cancer hazard (in humans)



POTENTIAL HEALTH EFFECTS:**INHALATION:**

SHORT TERM EXPOSURE: irritation (possibly severe), changes in body temperature, changes in blood pressure, nausea, vomiting, diarrhea, stomach pain, chest pain, difficulty breathing, headache, emotional disturbances, pain in extremities, bluish skin color, lung congestion

LONG TERM EXPOSURE: irritation, nausea, vomiting, diarrhea, loss of appetite, pain in extremities, blood disorders, bone disorders, liver damage, cancer

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation, allergic reactions, skin disorders

LONG TERM EXPOSURE: irritation, skin disorders, cancer

EYE CONTACT:

SHORT TERM EXPOSURE: irritation, sensitivity to light

LONG TERM EXPOSURE: irritation

INGESTION:

SHORT TERM EXPOSURE: skin disorders, metallic taste, white lines on the fingernails, changes in blood pressure, nausea, vomiting, diarrhea, stomach pain, irregular heartbeat, headache, dizziness, disorientation, pain in extremities, internal bleeding, blood disorders, nerve damage, convulsions, coma

LONG TERM EXPOSURE: irritation, nosebleed, nausea, vomiting, diarrhea, constipation, stomach pain, loss of appetite, weight loss, blood disorders, liver damage, reproductive effects, cancer

CARCINOGEN STATUS:

OSHA: Yes

NTP: Yes

IARC: Yes

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

ANTIDOTE: dimercaprol, intramuscular; penicillamine, oral

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage and catharsis. Consider oxygen.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

SECTION 6 ACCIDENTAL RELEASE MEASURES

SOIL RELEASE:

Wear personal protective clothing and equipment.

WATER RELEASE:

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:

Do not touch spilled material. Stop leak if possible without personal risk. Small spills: Absorb with sand or other non-combustible material. Collect with absorbent into suitable container. Small dry spills: Collect spilled material in appropriate container for disposal. Move containers away from spill to a safe area. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

HANDLING: Use methods to minimize dust.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

ARSENIC:

10 ug/m³ OSHA TWA

0.01 mg/m³ ACGIH TWA

0.002 mg/m³ NIOSH recommended ceiling 15 minute(s)

0.1 mg/m³ UK MEL TWA

MEASUREMENT METHOD: Particulate filter; Acid; Hydride generation atomic absorption spectrometry; NIOSH IV # 7900; ALSO # 7300, Elements

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves. **OSHA REGULATED SUBSTANCES:** U.S. OSHA 29 CFR 1910.1018.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

0.1 mg/m³

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any supplied-air respirator with a full facepiece.

0.5 mg/m³

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any supplied-air respirator with a full facepiece.

Any self-contained breathing apparatus with a full facepiece.

10 mg/m³

Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

20 mg/m³

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: solid

COLOR: gray to black

ODOR: garlic odor

MOLECULAR WEIGHT: 74.92

MOLECULAR FORMULA: As

BOILING POINT: Not applicable

MELTING POINT: 1497 F (814 C) @ 36 atm

SUBLIMATION POINT: 1135 F (613 C)

VAPOR PRESSURE: Not applicable

VAPOR DENSITY: Not applicable

SPECIFIC GRAVITY (water=1): 5.6-5.9

WATER SOLUBILITY: insoluble

PH: Not applicable

VOLATILITY: Not applicable

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not applicable

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: nitric acid

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Avoid generating dust. Keep out of water supplies and sewers.

INCOMPATIBILITIES: acids, oxidizing materials, halogens, combustible materials, metals

ARSENIC:

ACIDS: Reacts vigorously.

BROMATES: Reacts vigorously.

CHLORATES: Reacts vigorously.

FLUORINE: Reacts vigorously.

HYDROGEN GAS: Reacts vigorously.

LITHIUM: Reacts vigorously.

OXIDIZING MATERIALS: Reacts vigorously.

PALLADIUM: Reacts vigorously.

POTASSIUM: Reacts vigorously.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: arsine, arsenic

POLYMERIZATION: Will not polymerize.

SECTION TOXICOLOGICAL INFORMATION

ARSENIC:

TOXICITY DATA:

7857 mg/kg/55 year(s) oral-man TDLo; 4 mg/kg oral-child TDLo; 763 mg/kg oral-rat LD50; 13390 ug/kg intraperitoneal-rat LD50; 145 mg/kg oral-mouse LD50; 46200 ug/kg intraperitoneal-mouse LD50; 300 mg/kg subcutaneous-rabbit LDLo; 10 mg/kg intraperitoneal-guinea pig LDLo; 300 mg/kg subcutaneous-guinea pig LDLo; 1360 mg/kg/17 day(s) intermittent oral-rat TDLo

CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Sufficient Evidence, Animal Limited Evidence, Group 1; ACGIH: A1 -Confirmed Human Carcinogen; EC: Category 1

An increased incidence of skin and lung cancer has been associated with inorganic arsenic compounds through medical treatment, contaminated drinking water or occupational exposure. Cancers at other sites have also been reported, but a clear association has not been confirmed.

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Moderately Toxic: ingestion

TARGET ORGANS: immune system (sensitizer), nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: diabetes, heart or cardiovascular disorders, immune system disorders or allergies, kidney disorders, liver disorders, nervous system disorders, skin disorders and allergies

TUMORIGENIC DATA:

76 mg/kg oral-man TDLo/12 year(s) intermittent; 75 mg/kg implant-rabbit TDLo

MUTAGENIC DATA:

cytogenetic analysis - human unreported 4286 ug/kg; cytogenetic analysis - mouse oral 280 mg/kg 8 week(s)

REPRODUCTIVE EFFECTS DATA:

605 ug/kg oral-rat TDLo 35 week(s) pre pregnancy continuous; 580 ug/kg oral-rat TDLo 30 week(s) pre pregnancy/1-20 day(s) pregnant female continuous

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

ARSENIC: Inhalation of inorganic arsenic compounds may cause severe irritation of the nasal mucosa, larynx, and bronchi, cough with foamy sputum, pain in the chest on inspiration, dyspnea, lassitude, cyanosis, giddiness, headache, extreme general weakness, nausea, vomiting, colic, diarrhea, pain in the limbs, initial rise and then fall of temperature, leucocytosis, hypotension, and possibly pulmonary edema.

CHRONIC EXPOSURE:

ARSENIC: May cause weakness, loss of appetite, nausea, occasional vomiting, a sense of heaviness in the stomach, diarrhea, salivation, upper respiratory inflammation and discharge, conjunctivitis, a catarrhal state of the mucous membranes of the nose, larynx, and respiratory passages, coryza, hoarseness, mild tracheobronchitis, and perforation of the nasal septum. Skin lesions may occur and take many forms including increased pigmentation, keratosis of palms and soles eczema-like lesions, pale bands on the fingernails, alopecia and vitiligo. Peripheral neuritis may develop initially of the hands and feet, which is usually sensory. In very severe cases, motor paralysis may occur; the first muscles affected are usually the toe extensors and the peronei, and in only the most severe cases will paralysis of the flexor muscles of the feet or of the extensor muscles of the hands occur. Liver disease with cirrhosis, and depression of bone marrow may occur with various blood dyscrasias including aplastic anemia. Inorganic arsenic compounds have been shown to be skin and lung carcinogens in humans. The latency time between onset of exposure and the appearance of cancer is usually between 15 and 30 years.

SKIN CONTACT:

ACUTE EXPOSURE:

ARSENIC: Arsenic and inorganic arsenic compounds irritate the skin with erythema, itching and burning. Sensitization dermatitis may occur in previously exposed persons, characterized by eczema with scaling and hyperpigmentation of the skin and hyperkeratosis of the palms of the hands and the soles of the feet. Inorganic arsenic compounds are slightly absorbed through the skin when administered in a lipid vehicle. Poisoning has caused alopecia, bronzing of the skin, and brittle nails.

CHRONIC EXPOSURE:

ARSENIC: Occupational exposure to airborne arsenic may cause two types of skin disorders due to local irritation. An eczematous type with erythema, swelling and papules or vesicles and a follicular type with erythema and follicular swelling or follicular pustules. Dermatitis is usually localized on the most heavily exposed areas such as the face, back of the neck, forearms, wrists and hands. Less frequently the scrotum, the inner surfaces of the thighs, the upper chest and back, and the lower legs around the ankles may be affected. Chronic dermal lesions may follow this type of initial reaction but usually only after many years of exposure. Hyperkeratosis, warts and melanosis of the skin are conspicuous signs. In severe cases, arsenomelanosis is observed on the abdomen, chest, back and scrotum. These skin lesions may develop into precancerous and cancerous lesions.

EYE CONTACT:

ACUTE EXPOSURE:

ARSENIC: Arsenical dust may cause irritation characterized by itching, burning, watering of the eyes, photophobia and sometimes hyperemia and chemosis.

CHRONIC EXPOSURE:

ARSENIC: Repeated or prolonged eye contact with arsenic dust may cause conjunctivitis.

INGESTION:

ACUTE EXPOSURE:

ARSENIC: Ingestion of large doses may cause systemic poisoning with delayed symptoms usually appearing one hour after absorption. Symptoms may include burning and colicky pains in the esophagus, stomach and bowel, constriction in the throat, difficulty in swallowing, muscular cramps, weakness, a sweetish metallic taste and a garlicky odor of the breath and feces. Violent gastroenteritis may occur with vomiting, copious watery or bloody diarrhea containing shreds of mucus, and dehydration with intense thirst and muscular cramps. Vertigo, frontal headache, delirium and even mania may develop without prominent gastrointestinal signs. Later symptoms may include, cold and clammy skin, fall in blood pressure, extreme weakness, edema of the face and eyelids, tachycardia, vasomotor collapse, convulsions, shock, coma and death due to circulatory failure. Death after a fatal dose occurs usually between 12 and 48 hours. If the victim recovers, a symmetrical peripheral neuropathy may occur with numbness and paresthesias beginning in the distal extremities, lower limbs before the upper, which spreads rapidly and increases in intensity. Motor weakness of the distal extremities may occur and the palsy is likely to affect the long extensors of fingers and toes. Horizontal white lines (striations) on the fingernails and toenails are commonly seen and are considered to be a diagnostic accompaniment of arsenical polyneuritis. Other adverse effects seen after recovery may include jaundice, oliguria or anuria, anemia, leukopenia and exfoliative dermatitis. Inorganic arsenic crosses the placenta barrier, and neonatal death from arsenic has been reported following acute maternal intoxication.

CHRONIC EXPOSURE:

ARSENIC: Repeated ingestion of small amounts may cause gastrointestinal symptoms such as diarrhea alternating with constipation, nausea, vomiting, abdominal cramps, salivation, malaise, fatigue, and loss of appetite and weight. Damage to the nervous system may be apparent with polyneuritis, anesthetics, paresthesia such as burning pains in the hands and feet, and optic neuritis. The skin may be affected with pigmentation, localized edema, dermatitis, hyperkeratosis, and alopecia. Eye involvement may occur causing conjunctivitis with a sensation of irritation and tearing. Pigment spots in the epithelium of both the cornea and conjunctiva may appear. Other signs of poisoning may include anemia, leukopenia, thrombocytopenia, disturbed erythropoiesis in the bone marrow cells, depressed or disturbed myelopoiesis, hepatitis, cirrhosis or noncirrhotic portal entry. Skin and lung cancer in humans is associated with chronic exposure to arsenic. Repeated administration to female rats prior to mating produced effects on fertility. Repeated administration during gestation produced specific developmental abnormalities in the offspring.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

FISH TOXICITY: 9900 ug/L 96 hour(s) LC50 (Mortality) Fathead minnow (*Pimephales promelas*)

INVERTEBRATE TOXICITY: 2319 ug/L 96 hour(s) LC50 (Mortality) Opossum shrimp (*Mysidopsis bahia*)

ALGAL TOXICITY: 25000 ug/L NR hour(s) EC50 (Population Growth) Diatom (*Phaeodactylum tricornutum*)

PHYTOTOXICITY: 2600 ug/L 32 week(s) EC50 (Biomass) Water-milfoil (*Myriophyllum spicatum*)

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Hazardous Waste Number(s): D004. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 5.0 mg/L.

SECTION 14 RANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Arsenic
ID NUMBER: UN1558
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: II



CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Arsenic
ID NUMBER: UN1558
CLASSIFICATION: 6.1
PACKING GROUP: II

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Arsenic
UN NUMBER: UN1558
ADR/RID CLASS: 6.1
CLASSIFICATION CODE: T5
PACKING GROUP: II

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Arsenic
UN/ID NUMBER: UN1558
IATA/ICAO CLASS: 6.1
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Arsenic
UN NUMBER: UN1558
IMDG CLASS: 6.1
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
ARSENIC: 1 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
 Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
 Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: Yes

CHRONIC: Yes

FIRE: No

REACTIVE: No

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):

ARSENIC

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:

California Proposition 65:

Known to the state of California to cause the following:

ARSENIC

Cancer (Feb 27, 1987)

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (ASSIGNED):

T Toxic

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:



EC RISK AND SAFETY PHRASES:

| | |
|------------|---|
| R 23/25 | Toxic by inhalation and if swallowed. |
| S 1/2 | Keep locked-up and out of reach of children. |
| S 20/21 | When using, do not eat, drink or smoke. |
| S 28 | After contact with skin, wash immediately with plenty of soap and water. |
| S 45 | In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). |

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

SECTION 3 HAZARDS IDENTIFICATION

©Copyright 1984-2002 MDL Information Systems, Inc. All rights reserved



MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: BARIUM

TRADE NAMES/SYNONYMS:

BARIUM METAL; BARIUM, METALLIC; METALLIC BARIUM; BARIUM ELEMENT; Ba; UN
1400; OHS02270; RTECS CQ8370000

CHEMICAL FAMILY: metal

CREATION DATE: Mar 19 1985

REVISION DATE: Sep 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: BARIUM

CAS NUMBER: 7440-39-3

EC NUMBER (EINECS): 231-149-

PERCENTAGE: 100.0

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=2

EMERGENCY OVERVIEW:

COLOR: white

PHYSICAL FORM: solid

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation

PHYSICAL HAZARDS: Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode. Extremely flammable. May ignite spontaneously on exposure to air. Reacts violently with water to generate toxic and/or flammable gases. May ignite on contact with water.



POTENTIAL HEALTH EFFECTS:**INHALATION:**

SHORT TERM EXPOSURE: irritation, vomiting, diarrhea, difficulty breathing, irregular heartbeat, emotional disturbances, paralysis, convulsions

LONG TERM EXPOSURE: no information is available

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation

INGESTION:

SHORT TERM EXPOSURE: vomiting, digestive disorders, diarrhea, stomach pain, difficulty breathing, irregular heartbeat, drowsiness, dizziness, emotional disturbances, tremors, internal bleeding, kidney damage, paralysis, convulsions

LONG TERM EXPOSURE: no information on significant adverse effects

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention.

ANTIDOTE: sodium sulfate solution, oral, gastric tube; potassium.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode. Finely divided material may ignite spontaneously. May ignite on exposure to air.

EXTINGUISHING MEDIA: regular dry chemical, dry sand, lime, soda ash

Large fires: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn.

FIRE FIGHTING: Do not use water. Do not use foam. Move container from fire area if it can be done

without risk. Use extinguishing agents appropriate for surrounding fire. Do not get water inside container. Avoid inhalation of material or combustion by-products.

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Do not touch spilled material. Stop leak if possible without personal risk. Do not get water directly on material. Small dry spills: Collect material into suitable, loosely covered container for disposal. Move containers away from spill to a safe area. Small liquid spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Powder spills: Cover with plastic sheet or tarp to minimize spreading and protect from contact with water. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas.

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

BARIUM:

BARIUM, SOLUBLE COMPOUNDS (as Ba):

0.5 mg/m³ OSHA TWA

0.5 mg/m³ ACGIH TWA

0.5 mg/m³ NIOSH recommended TWA 10 hour(s)

0.5 mg/m³ DFG MAK (peak limitation category-II, with excursion factor of 2) (inhalable dust fraction)

0.5 mg/m³ EC OEL

0.5 mg(Ba)/m³ UK OES TWA

MEASUREMENT METHOD: Particulate filter; Water; Flame atomic absorption spectrometry
NIOSH IV # 7056, Barium, Soluble Compounds

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

Measurement Element:**Barium (Ba)****5 mg/m³**

Any dust and mist respirator except single-use and quarter-mask respirators.

Any supplied-air respirator.

12.5 mg/m³

Any supplied-air respirator operated in a continuous-flow mode.

Any powered, air-purifying respirator with a dust and mist filter.

25 mg/m³

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any supplied-air respirator with a tight-fitting facepiece that is operated in a continuous-flow mode.

Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.

Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

50 mg/m³

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

Escape -

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: solid**APPEARANCE:** lustrous**COLOR:** white**ODOR:** Not available**MOLECULAR WEIGHT:** 137.33**MOLECULAR FORMULA:** Ba**BOILING POINT:** 2984 F (1640 C)**MELTING POINT:** 1337 F (725 C)**VAPOR PRESSURE:** 10 mmHg @ 1049 C**VAPOR DENSITY:** Not applicable**SPECIFIC GRAVITY (water=1):** 3.51**WATER SOLUBILITY:** reacts**PH:** Not applicable**VOLATILITY:** Not applicable**ODOR THRESHOLD:** Not available**EVAPORATION RATE:** Not applicable**COEFFICIENT OF WATER/OIL DISTRIBUTION:** Not available**SOLVENT SOLUBILITY:**

Soluble: alcohol

Insoluble: benzene

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Reacts violently with water to generate toxic and/or flammable gases. May ignite on contact with water.

CONDITIONS TO AVOID: Avoid contact with air. Keep dry. Keep out of water supplies and sewers.

INCOMPATIBILITIES: acids, bases, halogens, halo carbons, oxidizing materials

BARIUM:

ACIDS: Violent reaction.

AMMONIA: Incompatible.

BROMINE PENTAFLUORIDE: Violent reaction and possible ignition.

CARBON TETRACHLORIDE: Violent reaction or possible explosion.

FLUOROTRICHLOROMETHANE: Forms an explosive mixture.

IODINE HEPTAFLUORIDE: Exothermic reaction.

OXIDIZERS (STRONG): Fire and explosion hazard.

TETRACHLOROETHYLENE: Forms an explosive mixture.

TRICHLOROETHYLENE: Forms an explosive mixture.

TRICHLOROTRIFLUOROETHANE: Forms an explosive mixture.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: oxides of barium

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

BARIUM:

TOXICITY DATA:

26622 mg/kg/69 week(s) continuous oral-rat TDLo

CARCINOGEN STATUS: ACGIH: A4 -Not Classifiable as a Human Carcinogen (Barium and soluble compounds)

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

BARIUM: May cause sore throat, coughing, shortness of breath, vomiting, diarrhea, trembling, faintness, and paralysis of the arms and legs. Barium and its soluble compounds may also cause dyspnea, weakness, anxiety, cardiac irregularity and other muscle stimulation effects, and convulsions.

CHRONIC EXPOSURE:

BARIUM: No data available.

SKIN CONTACT:

ACUTE EXPOSURE:

BARIUM: May cause irritation.

CHRONIC EXPOSURE:

BARIUM: Repeated or prolonged contact may cause dermatitis.

EYE CONTACT:**ACUTE EXPOSURE:**

BARIUM: Direct contact may cause irritation, redness, and pain.

CHRONIC EXPOSURE:

BARIUM: Repeated or prolonged exposure may cause conjunctivitis.

INGESTION:**ACUTE EXPOSURE:**

BARIUM: Barium and soluble barium compounds may cause salivation, vomiting, severe diarrhea with watery and bloody stools, colic, gastroenteritis, weakness, giddiness, anxiety, tinnitus, vertigo, confusion, and increasing somnolence without coma, dyspnea, slow pulse, hypokalemia, delayed kidney damage, and at high levels, hemolysis and hemorrhages in the stomach, intestines and kidneys may occur. Stimulation of all muscle types may result in hyperperistalsis, bladder contraction, lumbar pain, muscle twitching progressing to convulsions and/or paralysis, vasoconstriction, and irregular contraction of the heart followed by arrest in systole. Death may occur from cardiac or respiratory failure.

CHRONIC EXPOSURE:

BARIUM: No effects have been reported in humans. Animal studies have shown effects on the hemopoietic and central nervous systems.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

FISH TOXICITY: >500000 ug/L 96 hour(s) LC50 (Mortality) Sheepshead minnow (*Cyprinodon variegatus*)

INVERTEBRATE TOXICITY: >500000 ug/L 96 hour(s) LC50 (Mortality) Opossum shrimp (*Mysidopsis bahia*)

ALGAL TOXICITY: >500000 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (*Skeletonema costatum*)

PHYTOTOXICITY: 26000 ug/L 4 hour(s) EC50 (Growth) Duckweed (*Lemna minor*)

ENVIRONMENTAL SUMMARY: Harmful to aquatic life.

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001, D003, D005. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 100.0 mg/L. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:



PROPER SHIPPING NAME: Barium
ID NUMBER: UN1400
HAZARD CLASS OR DIVISION: 4.3
PACKING GROUP: II

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Barium
ID NUMBER: UN1400
CLASSIFICATION: 4.3
PACKING GROUP: II

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Barium
UN NUMBER: UN1400
ADR/RID CLASS: 4.3
CLASSIFICATION CODE: W2
PACKING GROUP: II

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Barium
UN/ID NUMBER: UN1400
IATA/ICAO CLASS: 4.3
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Barium
UN NUMBER: UN1400
IMDG CLASS: 4.3
PACKING GROUP: II

SECTION 5 REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
 Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
 Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: Yes

CHRONIC: No

FIRE: Yes

REACTIVE: Yes

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):

BARIUM, SOLUBLE COMPOUNDS (as Ba)

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated

STATE REGULATIONS:

California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (CALCULATED):

| | |
|----|----------|
| Xi | Irritant |
|----|----------|

DANGER/HAZARD SYMBOL:



EC RISK AND SAFETY PHRASES:

| | |
|------|---|
| R 14 | Reacts violently with water. |
| R 36 | Irritating to eyes. |
| R 37 | Irritating to respiratory system. |
| R 38 | Irritating to skin. |
| S 2 | Keep out of reach of children. |
| S 8 | Keep container dry. |
| S 24 | Avoid contact with skin. |
| S 25 | Avoid contact with eyes. |
| S 26 | In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. |
| S 30 | Never add water to this product. |
| S 46 | If swallowed, seek medical advice immediately and show this container or label. |

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

SECTION 14 TRANSPORT INFORMATION

©Copyright 1984-2002 MDL Information Systems, Inc. All rights reserved.



MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite
300

Nashville, TN 37217-2423

1-615-366-2000

EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH
AMERICA)

1-703-527-3887
(INTERNATIONAL)

SUBSTANCE: BERYLLIUM

TRADE NAMES/SYNONYMS:

BERYLLIUM-9; GLUCINIUM; BERYLLIUM ELEMENT; GLUCINUM; RCRA P015; UN 1567; Be;
OHS02910; RTECS DS1750000

CHEMICAL FAMILY: metal

CREATION DATE: Mar 22 1985

REVISION DATE: Sep 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: BERYLLIUM

CAS NUMBER: 7440-41-7

EC NUMBER (EINECS): 231-150-7

EC INDEX NUMBER: 004-001-00-7

PERCENTAGE: 100.0

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE= REACTIVITY=0

EMERGENCY OVERVIEW:

COLOR: white

PHYSICAL FORM: solid

ODOR: odorless

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, allergic reactions, cancer hazard (in humans)

PHYSICAL HAZARDS: Flammable solid. Negligible fire and explosion hazard in bulk form. Dust/air



mixtures may ignite or explode. May react on contact with water.

POTENTIAL HEALTH EFFECTS:**INHALATION:**

SHORT TERM EXPOSURE: same as effects reported in long term exposure, irritation, fever, difficulty breathing, irregular heartbeat, lung congestion

LONG TERM EXPOSURE: skin disorders, changes in blood pressure, weight loss, chest pain, difficulty breathing, fatigue, lung damage, blood disorders, bone disorders, kidney damage, liver damage, cancer

SKIN CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation

EYE CONTACT:

SHORT TERM EXPOSURE: irritation

LONG TERM EXPOSURE: irritation

INGESTION:

SHORT TERM EXPOSURE: irritation, difficulty breathing

LONG TERM EXPOSURE: no information on significant adverse effects

CARCINOGEN STATUS:

OSHA: No

NTP: Yes

IARC: Yes

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If a large amount is swallowed, get medical attention.

ANTIDOTE: calcium disodium edetate/dextrose, intravenous; calcium disodium edetate/procaine, intramuscular.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode. Dust/air mixtures may ignite or explode.

EXTINGUISHING MEDIA: dolomite, dry powder for metal fires, dry sand, graphite, soda ash, sodium chloride

Do not get water directly on material

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products.

SECTION 6 **ACCIDENTAL RELEASE MEASURES**

WATER RELEASE:

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:

Large spills: Collect spilled material in appropriate container for disposal. Avoid generating dust. Clean up residue with a high-efficiency particulate filter vacuum. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 **HANDLING AND STORAGE**

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a cool, dry place. Store in a well-ventilated area. Keep separated from incompatible substances. Keep separated from incompatible substances.

SECTION 8 **EXPOSURE CONTROLS, PERSONAL PROTECTION**

EXPOSURE LIMITS:

BERYLLIUM:

BERYLLIUM AND COMPOUNDS:

2 ug(Be)/m³ OSHA TWA

5 ug(Be)/m³ OSHA ceiling

25 ug(Be)/m³ OSHA peak 30 minute(s)

0.002 mg(Be)/m³ ACGIH TWA

0.01 mg(Be)/m³ ACGIH STEL

0.0005 mg(Be)/m³ NIOSH recommended TWA 10 hour(s) (not to exceed)

0.005 mg/m³ AGS TRK (inhalable dust fraction) (metal)

0.002 mg/m³ AGS TRK (inhalable dust fraction) (others)

0.002 mg(Be)/m³ UK MEL TWA

MEASUREMENT METHOD: Particulate filter; Acid; Graphite furnace atomic absorption spectrometry; NIOSH IV # 7102, ALSO # 7300, Elements

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain

and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

At any detectable concentration -

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Escape -

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: solid

COLOR: white

ODOR: odorless

MOLECULAR WEIGHT: 9.01

MOLECULAR FORMULA: Be

BOILING POINT: 5378 F (2970 C) @ 5 mmHg

MELTING POINT: 2323-2341 F (1273-1283 C)

VAPOR PRESSURE: 7.6 mmHg @ 1910 C

VAPOR DENSITY: Not applicable

SPECIFIC GRAVITY (water=1): 1.848

WATER SOLUBILITY: Not available

PH: Not applicable

VOLATILITY: Not applicable

ODOR THRESHOLD: Not available

EVAPORATION RATE: Not applicable

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:

Soluble: dilute acids, alkali

Insoluble: nitric acid, mercury

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Avoid contact with water or moisture. May react with evolution of heat on contact with water.

CONDITIONS TO AVOID: Avoid generating dust. Avoid heat, flames, sparks and other sources of ignition.

INCOMPATIBILITIES: acids, bases, halo carbons, oxidizing materials, halogens, metals, combustible materials

BERYLLIUM:

ACIDS (STRONG): Reacts to produce flammable hydrogen gas.

BASES (STRONG): Attacked and evolves flammable hydrogen gas.

CARBON DIOXIDE: Violent reaction.

CARBON DIOXIDE + NITROGEN: May ignite on heating.

CARBON TETRACHLORIDE: Forms shock-sensitive mixture.

CHLORINE: Incandescent reaction when heated.

FLUORINE: Incandescent reaction when heated.

HALIDES: Reacts.

HALOCARBON SOLVENTS: May form shock-sensitive mixtures.

HYDROCHLORIC ACID: Reacts with finely divided or amalgamated beryllium.

LITHIUM: Severely attacks beryllium metal.

METALS (ALKALI): Reacts to form salts.

NITRIC ACID (DILUTE): Reacts with finely divided or amalgamated beryllium.

OXIDIZERS: Reacts vigorously.

PHOSPHORUS: Incandescent reaction on heating.

SULFURIC ACID (DILUTE): Reacts with finely divided or amalgamated beryllium.

TRICHLOROETHYLENE: Forms shock-sensitive mixture.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: oxides of beryllium

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

BERYLLIUM:

TOXICITY DATA:

496 ug/kg intravenous-rat LD50; 51 mg/kg intratracheal-rat LD50; 20 ng/m³/8 hour(s)-26 week(s) intermittent inhalation-rat TCLo; 20 ng/m³/1 hour(s)-17 week(s) intermittent inhalation-mammal TCLo

CARCINOGEN STATUS: NTP: Anticipated Human Carcinogen; IARC: Human Sufficient Evidence, Animal Sufficient Evidence, Group 1 (Beryllium and beryllium compounds); ACGIH: A1 -Confirmed Human Carcinogen (Beryllium and beryllium compounds); TRGS 905: K 2

Occupational exposure to beryllium and its compounds has resulted in an increased risk of lung cancer. Exposure by inhalation or intratracheal instillation resulted in lung tumors in rats. Rabbits receiving intravenous injections, implantations, or injections into the bone resulted in osteosarcomas.

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL: Insufficient Data.

TARGET ORGANS: immune system (sensitizer)

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders

TUMORIGENIC DATA:

13 mg/kg intratracheal-rat TDLo; 20 mg/kg intravenous-rabbit TDLo

MUTAGENIC DATA:

DNA adduct - Escherichia coli 30 umol/L; DNA inhibition - non-mammalian species intravenous 30 umol/kg; DNA adduct - human HeLa cell 30 umol/L; DNA adduct - mouse Ascites tumor 30 umol/L

ADDITIONAL DATA: May cross the placenta.

Contact with beryllium compounds may exacerbate a preexisting berylliosis condition.

HEALTH EFFECTS:**INHALATION:****ACUTE EXPOSURE:**

BERYLLIUM: Brief, intense exposure to pulmonary irritants may cause severe chemical pneumonitis. Symptoms may include bronchial spasm, nasopharyngitis, tracheobronchitis, cough, blood tinged sputum, dyspnea, cyanosis, nasal discharge, fever, anorexia, fatigue, tachycardia and possibly cor pulmonale. Fatal pulmonary edema or spontaneous pneumothorax have been reported. Studies in rats indicate a severe, chemical pneumonitis followed by a quiescent period of minimal inflammation and mild fibrosis occurs. Later, progressive fibrosing pneumonitis was observed in these rats. With sufficient exposure, effects as detailed in chronic exposure may occur.

CHRONIC EXPOSURE:

BERYLLIUM: In addition to the effects described in acute exposure, prolonged or repeated exposure may cause "berylliosis", a disorder that generally affects the upper and lower respiratory tract, but the onset may be marked by weakness, fatigue, and weight loss with or without dyspnea. Symptoms may be delayed from 1-25 years from exposure and may be precipitated by additional physical stress. Signs of pulmonary insufficiency and systemic effects may occur including dyspnea on exertion or at rest, burning chest pain, constant non-productive hacking cough, wheezing, clubbing of fingers, low blood pressure, enlarged liver, spleen and parotid gland, osteoarthropathy, increase in hematocrit, elevated serum uric acid, nephrolithiasis, hypercalciuria with or without stones, hypercalcemia, spontaneous skin lesions, and cor pulmonale due to increasing pulmonary fibrosis and pulmonary resistance. Less common effects may include hemoptysis, seizure disorders and palpitations. Severely disabled persons may show cachexia and signs of right heart impairment with severe non-productive cough, spontaneous pneumothorax, and bouts of chills and fever. Death may be due to cardiac or respiratory failure, or in rare cases, renal failure. Pathological findings include extrapulmonary changes of focal granulomatous lesions in the abdominal lymph nodes, spleen, liver, and bone marrow, as well as renal involvement. Human studies indicate that berylliosis may be a disease resulting from pulmonary sensitization and responding with inflammatory changes which tend to be granulomatous. Cumulative exposure to beryllium has produced decreased lung function that is distinct from berylliosis. Epidemiological studies show an excess of lung cancer in white males occupationally exposed to beryllium or beryllium compounds.

SKIN CONTACT:**ACUTE EXPOSURE:**

BERYLLIUM: May cause irritation. Sensitization is reported to not occur from contact of intact skin with beryllium metal. However, accidental implantation of particles beneath the skin may cause necrosis of adjacent tissue, formation of ulcer, and granulomatous hypersensitivity reaction.

CHRONIC EXPOSURE:

BERYLLIUM: Repeated exposure to irritants may cause dermatitis.

EYE CONTACT:**ACUTE EXPOSURE:**

BERYLLIUM: Contact with dust may cause conjunctival inflammation. Introduction into corneas of rabbits produced slight clouding of the surrounding cornea.

CHRONIC EXPOSURE:

BERYLLIUM: May cause conjunctivitis and possibly severe periorbital edema.

INGESTION:**ACUTE EXPOSURE:**

BERYLLIUM: May cause coughing and shortness of breath. Experimental evidence suggest that little

beryllium is absorbed from the gastrointestinal tract.

CHRONIC EXPOSURE:

BERYLLIUM: In animal studies, beryllium metal eaten in the diet at a level of 5% is so poorly absorbed that no effect on growth occurred over long periods of feeding. However, beryllium tends to displace magnesium in the body after a prolonged period of time.

SECTION 12 ECOLOGICAL INFORMATION

Not available

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): P015. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Beryllium, powder

ID NUMBER: UN1567

HAZARD CLASS OR DIVISION: 6.1

PACKING GROUP: II

**CANADIAN TRANSPORTATION OF DANGEROUS GOODS:**

SHIPPING NAME: Beryllium powder

ID NUMBER: UN1567

CLASSIFICATION: 6.1, 4.1

PACKING GROUP: II

LAND TRANSPORT ADR/RID:

PROPER SHIPPING NAME: Beryllium powder

UN NUMBER: UN1567

ADR/RID CLASS: 6.1

CLASSIFICATION CODE: TF3

PACKING GROUP: II

AIR TRANSPORT IATA/ICAO:

PROPER SHIPPING NAME: Beryllium powder

UN/ID NUMBER: UN1567

IATA/ICAO CLASS: 6.1

PACKING GROUP: II

MARITIME TRANSPORT IMDG:

PROPER SHIPPING NAME: Beryllium powder

UN NUMBER: UN1567

IMDG CLASS: 6.1

PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):

BERYLLIUM: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):

Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):

Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: Yes

CHRONIC: Yes

FIRE: Yes

REACTIVE: Yes

SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):

BERYLLIUM AND COMPOUNDS

BERYLLIUM

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated

STATE REGULATIONS:

California Proposition 65:

Known to the state of California to cause the following:

BERYLLIUM AND COMPOUNDS

Cancer (Oct 01, 1987)

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:

EC CLASSIFICATION (ASSIGNED):

| | |
|----|-----------------------|
| T+ | Very Toxic |
| T | Toxic |
| Xi | Irritant |
| | Sensitizing |
| | Carcinogen Category 2 |

EC Classification may be inconsistent with independently-researched data

DANGER/HAZARD SYMBOL:



EC RISK AND SAFETY PHRASES:

| | |
|------------|---|
| R 25 | Toxic if swallowed. |
| R 26 | Very toxic by inhalation. |
| R 36/37/38 | Irritating to eyes, respiratory system and skin. |
| R 43 | May cause sensitization by skin contact. |
| R 48/23 | Toxic: danger of serious damage to health by prolonged exposure through inhalation. |
| R 49 | May cause cancer by inhalation. |
| S 45 | In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). |
| S 53 | Avoid exposure - obtain special instructions before use. |

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION**MSDS SUMMARY OF CHANGES****SECTION 14 TRANSPORT INFORMATION**

©Copyright 1984-2002 MDL Information Systems, Inc. All rights reserved